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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte MAKOTO MIYAMOTO, REIJI TAMURA,
AKIRA KASHIWAKURA, HIROSHI SHIRAI, YOSHIHIRO IKARI,
MAKOTO IIMURA, YUMIKO ABZAI, and KAZUYO UMEZAWA

Appeal 2008-0758
Application 10/656,337
Technology Center 1700

Decided: March 25, 2008

Before EDWARD C. KIMLIN, BRADLEY R. GARRIS, and
CHARLES F. WARREN, *Administrative Patent Judges*.

WARREN, *Administrative Patent Judge*.

DECISION ON APPEAL

Applicants appeal to the Board from the decision of the Primary Examiner finally rejecting claims 1 through 9 in the Office Action mailed March 2, 2006. Subsequently, Appellants canceled claims 2 through 9 in the Amendment filed October 31, 2006 (Amendment) as entered in the Office

Action mailed January 8, 2007, leaving claim 1 on appeal. 35 U.S.C. §§ 6 and 134(a) (2002); 37 C.F.R. § 41.31(a) (2006).

The appeal was heard March 11, 2008.

We affirm the decision of the Primary Examiner.

Claim 1, as it stands of record in the Amendment, illustrates Appellants' invention of an information-recording medium:

1. An formation-recording medium comprising a substrate and a recording layer which is rewritable in accordance with phase-change caused by being irradiated with a laser beam, the information recording medium further comprising at least one other layer formed over the recording layer, wherein the recording layer consists of Bi, Ge, and Te, and composition ratios thereof are within a range surrounded by the following respective points on a triangular composition diagram having apexes corresponding to Bi, Ge, and Te, and the recording layer has a film thickness of not more than 15 nm:

F3 (Bi_{3.5}, Ge₄₆, Te_{50.5});

C3 (Bi₄, Ge₄₆, Te₅₀);

D3 (Bi₅, Ge₄₆, Te₄₉);

D5 (Bi₁₀, Ge₄₂, Te₄₈);

C5 (Bi₁₀, Ge₄₁, Te₄₉);

F5 (Bi_{7.5}, Ge₄₁, Te_{51.5}).

The Examiner relies upon the evidence in these references (Ans. 3):

Kojima

US 6,761,950 B2

Jul. 13, 2004

Translation of Yamada^{1,2} JP 63-225935 A Sep. 20, 1988

Appellants request review of the ground of rejection of claim 1 under 35 U.S.C. § 103(a) over Kojima in view of Yamada. App. Br. 7; Ans. 3.

The issue in this appeal is whether the Examiner has carried the burden of establishing a prima facie case of obviousness.

The plain language of claim 1 specifies an information recording medium comprising at least any substrate, a recording layer having a thickness of not more than 15 nm, and at least any additional layer formed on the recording layer. The recording layer is rewritable with a laser beam and consists of any bismuth (Bi), germanium (Ge) and tellurium (Te) composition in atomic percent ratios within the range surrounded by the points on a triangular composition diagram with Bi, Ge, and Te apexes, specified by the six listed Bi-Ge-Te compositions, as depicted in Specification Fig. 16. *See Spec.* ¶ 0116.

¹ Japanese Kokai Application JP 63-225935 A has not been entered into the Official electronic files of the USPTO. Indeed, the document entered is Japanese Patent JP 2574325 B2, October 24, 1996, via the Form PTO-1449 submitted by Appellant with the Information Disclosure Statement filed September 8, 2003, and attached to the Office Action mailed June 8, 2005. JP 2574325 refers to JP 63-225935, which are not the same documents as the Examiner contends. Ans. 4. We note that these Japanese patent documents cite United States Application 06/909,673, filed September 22, 1986, as the priority document. United States Application 08/053,343, a great-great-grandchild of Application 06/909,673, matured into US 6,268,107 B1, July 31, 2001.

² The Examiner entered the translation of Yamada prepared for the USPTO by Schreiber Translations, Inc. (PTO 07-1594 January 2007) in the Form PTO-892 attached to the Communication mailed January 25, 2007, prior to the filing of the Appeal Brief on January 31, 2007. JP 63-225935 is referred to in the Appeal Brief apparently on that basis. App. Br., e.g., 7. We refer to the translation in our opinion. The Examiner should complete the record by making JP 63-225935 part thereof.

We find Kojima would have disclosed to one of ordinary skill in this art an information recording medium comprising at least a substrate, a laser rewritable recording layer, and at least one layer formed over the recording layer. Kojima, e.g., col. 3, l. 26 to col. 11, l. 33. The recording can be, among other things, any Bi-Ge-Te composition, and 15 nm or less in thickness. Kojima col. 8, ll. 40-41 and 61-63; col. 16, ll. 22-34; col. 17, ll. 14-16; col. 19, ll. 12-21; col. 28, l. 64 to col. 28, l. 16; col. 30, ll. 5-12, col. 32, ll. 21-13, and Figs. 1, 5, and 7. Kojima discloses an information recording medium having a substrate, a recording layer made of the $\text{Bi}_4\text{Ge}_{45}\text{Te}_{51}$ composition having a thickness of 11 nm, and $(\text{ZrO}_2)_{50}(\text{SiO}_2)_{30}(\text{ZnS})_{20}$ dielectric layers formed on each side of the recording layer, as Sample 11-2 of Example 11. The performance properties of the exemplified information recording media having a capacity of 23 GB are demonstrated with respect to laser overwrite cyclability with a semiconductor laser having certain properties and operated at certain laser peak power and bias power, at linear velocity of 10 m/sec., and at least 10,000 overwrite cycles; the reported results found “acceptable.” Kojima col. 57, l. 46 to col. 59, l. 5, and Table 11. Kojima discloses dielectric layers, such as $(\text{ZrO}_2)_{50}(\text{SiO}_2)_{30}(\text{ZnS})_{20}$, that do not defuse S into the recording layer as do ZnS-20 mol % SiO_2 dielectric layers. Kojima, e.g., col. 3, l. 26 to col. 4, l. 56.

We find Yamada would have disclosed to one of ordinary skill in this art an information recording medium comprising at least a substrate, a laser rewritable recording layer which is a Bi-Ge-Te ternary composition, and at least one layer formed over the recording layer. Yamada, e.g., 2-3, 5-7, and 8-9. “[T]he fundamental [Bi-Ge-Te ternary] composition . . . exists, as

Figure 1 (b) indicates, along the line linking a pair of compositional points expressing binary stoichiometric compound compositions GeTe & Bi_2Te_3 and can be expressed by the following compositional formula:

$x\text{GeTe} (1-x) \text{Bi}_2\text{Te}_3$ ($0 < x < 1$).” Yamada 7; *see also* 8-9. Yamada Figs. 1(a)-(b) are triangular composition diagrams with Bi, Ge, and Te apexes. Yamada illustrates the Bi-Ge-Te recording layer compositions in, among other things, Example 3 with information recording media comprising a substrate, a Bi-Ge-Te composition recording layer 100 nm thick, and a ZnS dielectric layer on each side of the recording layer. The information recording media are tested for laser overwrite cyclability with certain laser characteristics, including power, and at a standard disk rotation velocity of 20 m/sec. Yamada 14-20 and Table II.

Yamada discloses the following conclusions from the tests in Example 3. The Bi-Ge-Te compositions along the compositional line exhibited at least 1,000,000 overwrite cycles at a maximum 30m/sec., and are designated “rank 1.” The compositions on either side of the compositional line do not perform as well, and “an overwriting action similar to that imputed to the composition [sic] along the line can be invoked by lowering the recording frequency and by decelerating the rotation velocity to 10 m/sec.: [sic] and then 5 m/sec.” Compositions “[w]ithin a range between approximately +5 atom% [toward Bi] & +3 atom% [toward Te]” with respect to the compositional line, exhibited 1,000,000 overwrite cycles at 25 m/sec. or less, and are designated “rank 2.” Compositions “[w]ithin a range between approximately +7 atom% toward Bi & 5 atom% toward Te” with respect to the compositional line, exhibited 100,000 overwrite cycles at 15 m/sec. or less, and are designated “rank 3.”

Compositions in the “permissible margins of compositional deviation” of “approximately +10 atm [sic, atom]% toward Bi . . . and +10 atm [sic, atom]% toward Te” with respect to the compositional line, exhibited 10,000 overwrite cycles at 5 m/sec. or less, and are designated “rank 4.” Yamada 15-16. The compositional ranges corresponding to each of ranks 2-4 are surrounded by the points specified by the respective four listed Bi-Ge-Te compositions in Table II on the triangular composition diagram depicted in Yamada Fig. 1(a). Yamada 16-19.

Appellants provide a partial triangular composition diagram based on Specification Fig. 16 and Yamada Figs. 1(a)-(b) showing the claimed Bi-Ge-Te compositional range encompassed by claim 1 (shaded area); Yamada’s compositional line for Bi-Ge-Te compositions representing the compositional range of rank 1; Kojima’s $\text{Bi}_4\text{Ge}_{45}\text{Te}_{51}$ composition on Yamada’s compositional line; and Yamada’s Bi-Ge-Te compositional ranges representing ranks 2 through 4. Reply Br. 1-2.

We determine the combined teachings of Kojima and Yamada, the scope of which we determined above, provide convincing evidence supporting the Examiner’s case that the claimed invention encompassed by claim 1, as we interpreted this claim above, would have been *prima facie* obviousness to one of ordinary skill in the information recording medium arts familiar with laser rewritable recording layers prepared with Bi-Ge-Ti compositions. We agree with the Examiner that Yamada’s teaching that small shifts in the atomic ratio of Bi-Ge-Ti compositions results in useful recording layers provides “a reasonable expectation of forming a useful optical recording media with similar performance to” Kojima’s $\text{Bi}_4\text{Ge}_{45}\text{Te}_{51}$, composition. Indeed, Kojima’s composition falls on Yamada’s rank 1

compositional line and within the ranges of the different performance ranks taught by Yamada. Thus, one of ordinary skill in this art would have used Bi-Ge-Te compositions falling along the compositional line and within the ranges of the different performance ranks taught by Yamada that are closely related to Kojima's composition in place of the $\text{Bi}_4\text{Ge}_{45}\text{Te}_{51}$ composition as the laser rewritable Bi-Ge-Te composition recording layer in Kojima's information recording media. Ans. 3-4 and 5-6. The Bi-Ge-Te compositions and the information recording media containing recording layers of these compositions taught by the references encompass the claimed information recording medium. In this respect, we note that Kojima's $\text{Bi}_4\text{Ge}_{45}\text{Te}_{51}$ composition is close to point F3, the $\text{Bi}_{3.5}\text{Ge}_{46}\text{Te}_{50.5}$ composition of the claimed range and falls on Yamada's rank 1 compositional line, which line of compositions is very close to, if not adjacent to, the line between said claim point F3 and claim point F5, the $\text{Bi}_{7.5}\text{Ge}_{41}\text{Te}_{51.5}$ composition. *See* the triangle composition diagram in the Reply Brief.

Accordingly, *prima facie*, one of ordinary skill in this art would have used Bi-Ge-Te compositions disclosed by Yamada of similar composition to Kojima's $\text{Bi}_4\text{Ge}_{45}\text{Te}_{51}$ composition as the recording layer in the information recording media of Kojima in the reasonable expectation of obtaining information recording media having the same or similar properties to that taught by Kojima and Yamada, thus reasonably arriving at information recording media falling within claim 1 without resort to Appellants' Specification. *See, e.g., In re Dillon*, 919 F.2d 688, 692-93 (Fed. Cir. 1990) (*en banc*) ("This court . . . reaffirms that structural similarity between claimed and prior art subject matter, proved by combining references or otherwise, where the prior art gives reason or motivation to make the

claimed compositions, creates a *prima facie* case of obviousness, and that the burden (and opportunity) then falls on an applicant to rebut that *prima facie* case.”), *cited with approval in Takeda Chem. Indus., Ltd. v. Alphapharm Pty., Ltd.*, 492 F.3d 1350, 1356-357 (Fed. Cir. 2007) (The “test for prima facie obviousness for chemical compounds[, requiring ‘a showing that the ‘prior art would have suggested making the specific molecular modifications necessary to achieve the claimed invention,’] is consistent with the legal principles enunciated in *KSR[Int’l Co. v. Teleflex Inc.*, 127 S.Ct. 1727, 1731 (2007)].”); *In re Payne*, 606 F.2d 303, 315 (CCPA 1979) (“An obviousness rejection based on similarity in chemical structure and function entails the motivation of one skilled in the art to make a claimed compound, in the expectation that compounds similar in structure will have similar properties.”).

Indeed, we are of the view that the disclosure of Kojima’s Bi₄Ge₄₅Te₅₁ composition, which is very close to, if not adjacent to, the claimed range of Bi-Ge-Te compositions, and the information recording medium of Sample 11-2 containing this material as the recording layer, alone would have rendered the claimed information recording medium *prima facie* obvious to one of ordinary skill in this art. Indeed, this person would have had a reasonable expectation that the information recording medium of Kojima’s Sample 11-2 has the same or similar properties as the claimed information recording medium. *See, e.g., Titanium Metals Corp. of America v. Banner*, 778 F.2d 775, 783 (Fed. Cir. 1985).” (“[T]he Russian article discloses two alloys having compositions very close to that of claim 3, which is 0.3% Mo and 0.8% Ni, balance titanium. The two alloys in the prior art have 0.25% Mo - 0.75% Ni and 0.31% Mo - 0.94% Ni, respectively. The proportions are

so close that prima facie one skilled in the art would have expected them to have the same properties.”).

Accordingly, we are of the opinion that, prima facie, one of ordinary skill in this art routinely following the combined teachings of Kojima and Yamada would have reasonably arrived at the claimed information recording medium encompassed by claim 1 including all of the limitations thereof, without recourse to Appellants’ Specification.

Upon reconsideration of the record as a whole, we determine Appellants’ contentions do not successfully rebut the prima facie case. We cannot agree with Appellants’ contentions that one of ordinary skill in this art would not combine Kojima and Yamada. App. Br. 11-13; Reply Br. 3-7. We are of the view that this person would have recognized that Kojima teaches using any Bi-Ge-Te composition in the laser rewritable information recording media disclosed therein, and that Yamada discloses Bi-Ge-Te compositions, the scope of which includes Kojima’s specific composition, will work in laser rewritable information recording media; both references disclosing similar performance in this respect for information recording media containing recording layers prepared from Bi-Ge-Te compositions. *See, e.g., In re Kahn*, 441 F.3d 977, 985-88 (Fed. Cir. 2006). We are not dissuaded by the differences in the thickness of the recording layer taught by the two references, and indeed, find no limitation on the thickness of such layer in Yamada’s disclosure including the examples thereof. App. Br. 11; Reply Br. 4-5. *See, e.g., In re Lamberti*, 545 F.2d 747, 750, 192 USPQ 278, 280 (CCPA 1976) (“The fact that neither of the references expressly discloses asymmetrical dialkyl moieties is not controlling; the question under 35 USC 103 is not merely what the references expressly teach, but

what they would have suggested to one of ordinary skill in the art at the time the claimed invention was made.”). Appellants do not establish that one of ordinary skill in this art would have expected the thickness of the recording layer used in the Yamada Examples to indicate the Bi-Ge-Te compositions therein are unsuitable for Kojima’s purposes where Kojima places no limit on such materials and discloses a composition falling within Yamada’s compositional line.

Appellants have also not established that Kojima’s disclosure of a different dielectric material which does not diffuse S into the recording layer as does Yamada’s dielectric material, would have discouraged this person from following Yamada’s teachings with respect to Bi-Ge-Te compositions as recording layers per se. App. Br. 11-13. *See, e.g., In re Kahn*, 441 F.3d 977, 985-89 (Fed. Cir. 2006) (quoting *In re Gurley*, 27 F.3d 551, 553 (Fed. Cir. 1994)); *In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004) (prior art “disclosure does not criticize, discredit, or otherwise discourage the solution claimed”). In this respect, Appellants’ reliance on the teachings of Kojima with respect to the performance of dielectric material disclosed therein at Table 2 in col. 39, is misplaced as this disclosure does not involve a Bi-Ge-Te composition. App. Br. 11-12. Indeed, Kojima establishes that Bi-Ge-Te compositions are useful with the dielectric material disclosed therein.

We are also not convinced by Appellants’ contentions that the teachings of different Bi-Ge-Te compositions ranked with respect to properties by Yamada would lead away from the claimed information recording medium. Reply Br. 5-6. Indeed, Kojima’s composition is in Yamada’s compositional line and Yamada teaches that compositions having

atomic ratios deviating from the compositional line perform as recording layers.

In this respect, we find no evidence in the disclosure in Appellants' Specification, as outlined in the Reply Brief at 6-7, that the same is based on an actual comparison of any claimed information recording medium with the information recording medium of Sample 11-2 of Kojima's Example 11 or an information recording medium disclosed by Yamada. Indeed, a showing of unexpected results must be based on evidence comparing the claims and the prior art with respect to the thrust of the ground of rejection and not on the properties of the claimed information recording medium alone as argued by counsel. *See, e.g., In re Geisler*, 116 F.3d 1465, 1470 (Fed. Cir. 1997) (“[I]t is well settled that unexpected results must be established by factual evidence.”); *In re Burckel*, 592 F.2d 1175, 1179-80 (CCPA 1979) (the claimed subject matter must be compared with the closest prior art in a manner which addresses the thrust of the rejection); *In re Hoch*, 428 F.2d 1341, 1343-44 (CCPA 1970) (evidence must provide an actual comparison of the properties of the claimed invention with the disclosure of the reference); *In re Dunn*, 349 F.2d 433, 439, 146 USPQ 479, 483 (CCPA 1965) (“[W]e do not feel it an unreasonable burden on appellants to require comparative examples relied on for non-obviousness to be truly comparative. The cause and effect sought to be proven is lost here in the welter of unfixed variables.”). Thus, “[m]ere argument or conclusory statements in the specification does not suffice.” *Geisler*, 116 F.3d at 1470 (quoting *In re De Blauwe*, 736 F.2d 699, 705 (Fed. Cir. 1984)); *see also, e.g., In re Lindner*, 457 F.2d 506, 508 (CCPA 1972) (“This court has said . . . that mere lawyers’ arguments unsupported by factual evidence are

insufficient to establish unexpected results. Likewise, mere conclusory statements in the specification and affidavits are entitled to little weight when the Patent Office questions the efficacy of those statements.” (citations omitted)).

Accordingly, based on our consideration of the totality of the record before us, we have weighed the evidence of obviousness found in the combined teachings of Kojima and Yamada with Appellants’ countervailing evidence of and argument for nonobviousness and conclude that the claimed invention encompassed by appealed claim 1 would have been obvious as a matter of law under 35 U.S.C. § 103(a).

The Primary Examiner’s decision is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv) (2007).

AFFIRMED

Appeal 2008-0758
Application 10/656,337

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